Attorney Docket No.: 040356-0332

AR 2800

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Hisayuki FURUSE

Title: ELECTRIC ROTATING MACHINE AND MANUFACTURING METHOD THEREOF

Appl. No.: 09/678,311

Filing Date: October 3, 2000

Examiner: T. Lam

Art Unit: 2834

BRIEF ON APPEAL

Director of the United States Patent and Trademark Office
Washington, D.C. 20231

Sir:

This Brief is being filed in triplicate together with a check in the amount of $430.00 covering the appeal fee plus extension of time. If this fee is deemed to be insufficient, authorization is hereby given to charge any deficiency (or credit any balance) to the undersigned's deposit account 19-0741.

This is an appeal from the decision of July 30, 2002 finally rejecting claims 3 and 6, and the corresponding Advisory Action of December 19, 2002.

REAL PARTY IN INTEREST

The real party in interest is the assignee, Nissan Motor Company, Ltd.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 3 and 6-9 were pending in the application. Claims 7-9 have been withdrawn from consideration by the Examiner as pertaining to a non-elected invention. Thus, claims 3 and 6 are on appeal.

STATUS OF AMENDMENTS

A reply (without amendments) in response to the final rejection was filed on December 2, 2002, subsequent to final rejection. The reply was deemed in the Advisory Action of December 19, 2002 as not overcoming the rejection of record.

Appendix A contains the claims on appeal.

SUMMARY OF INVENTION

The invention relates to an electric rotating machine, and more particularly to an improvement in a core of an electric motor/generator for vehicles.

The present invention addresses a specific problem of reducing a gap between cores within an electric motor/generator. More specifically, in one type of electric motor/generator, a rotor core(s) and/or stator core(s) of the electric motor/generator include stacks formed of layers of thin plates welded together. During the welding process, a convex projection is formed on the welded edge. This convex projection mandates a minimum gap between the cores, because the core facing the convex projection of an adjacent core will interfere with the convex projection unless a gap of sufficient width is provided between the adjacent cores. Hence, the gap between adjacent cores cannot be reduced beyond the minimum gap required for welding, which limits the compactness of

the electric motor/generator. This problem is particularly pertinent in multi-rotor electric rotating machines, because both of opposite surfaces of a middle core have corresponding portions interfering with a convex projection on a respective side, thereby requiring a gap on both sides of the middle core. The present invention effectively reduces the gap between adjacent cores, resulting in a more compact electrical motor/generator than conventional devices.

The claimed invention is an electric rotating machine, involving the following components:

(a) a middle core (23) comprising plural plates (23A) stacked in an axial direction;

(b) an outer core (22) disposed outside the middle core (23), and which rotates relative to the middle core (23); and

(c) an inner core (21) disposed inside the middle core (23), and which rotates relative to the middle core (23),

(d) wherein the plural plates (23A) are joined to a first fixing member (26) by a connecting member (28),

(e) wherein the middle core (23) is a stator core, and the outer core (22) and inner core (21) are rotor cores, and

(f) wherein the stator core (23) is formed by a plural split core (23B), the connecting member (28) is a bolt, and a space (23C) through which the bolt (28) passes is formed between adjacent split cores (23B).

ISSUES

Claims 3 and 6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,793,136 ("Redzic" hereafter) in view of U.S. Patent No. 3,597,646 ("Lawrenson" hereafter). Additionally, the July 30, 2002 Office Action states that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Redzic "as taught by Nakano". It is believed that this reference to Nakano is a typographical error, because the first sentence of paragraph 2 of the Office Action (which

summarizes the rejection) refers only to Redzic and Lawrenson, and because Nakano is referred to nowhere else in the Office Action. These are the sole issues on appeal.

GROUPING OF CLAIMS

Group I: Claims 3 and 6 stand or fall together (for purposes of this appeal).

ARGUMENT

The present invention addresses a specific problem of reducing the gap between cores within an electric motor/generator. As discussed in the "Summary of the Invention" section of page 1, line 21 to page 2, line 20 of the application, the present invention addresses a problem wherein the gap between the cores cannot be reduced beyond the minimum gap required for welding, which limits the compactness of the electric motor/generator.

As shown in Figure 6, an electrical motor/generator according to one embodiment of the present invention includes an inner rotor core 21 (inner core), an outer rotor core 22 (outer core), and a stator core 23 (middle core) which rotate relative to each other in a housing (page 3, lines 21 to 23). In the inner rotor core 21 and outer rotor core 22, the surfaces facing the stator core 23 are magnetic pole-faces (page 7, lines 4 to 5) because these surfaces direct the magnetic field through the stator core 23. Similarly, in the stator core 23, both the inner circumferential surface and outer circumferential surface of the stator core 23 are magnetic pole-faces, because these surfaces direct the magnetic field through the rotor cores 21 and 22.

The inner rotor core 21, outer rotor core 22 and stator core 23 are respectively formed in stacks of plural thin silicon steel plates (page 6, lines 18 to 19). In manufacturing the inner rotor core 21 and outer rotor core 22, the stacks of plural thin silicon steel plates are joined by welding *the opposite side of the magnetic pole-faces* (page 7, lines 5 to 6); namely, the sides which do *not* face the stator core 23. Thus, the convex projections which form on the welded edges (in the prior art) do *not* project towards an adjacent core (i.e., stator core 23), which eliminates the need for an enlarged gap between the stator core 23 and the rotor cores 21 and 22 to accommodate the convex projections.

As shown in the end view of Figure 7, the stator core 23 is also formed of stacks of plural thin-plates (page 6, line 22). More specifically, the thin-plate 23A in the stator core 23 comprises plural I-shaped split cores 23B on the same circumference (page 6, lines 22 to 23). The cores 23B are fixed in place by providing space 23C between adjacent split cores, the space 23C being of sufficient size for bolt 28 (page 6, lines 23 to 24). Thus, the stator core 23 is fixed in place to a flange 26 by bolts 28 together with a plate 27 (page 6,

line 21; Figure 9); i.e., not by welding the stacks of thin-plates 23A on either of the magnetic pole-faces.

After the stator core 23 is fixed in place to the flange 26 by bolts 28 (and prior to insertion of the rotor cores 21 and 22), the inner circumferential surface and outer circumferential surface remain exposed, and can be easily surface-finished by a grindstone 101 or the like (page 7, lines 12 to 17). This allows the magnetic pole-faces on these surfaces to be surface-finished to precise tolerances, which also reduces the gap size between adjacent cores 23B in the stator 23 (page 8, lines 4 to 5). Moreover, by eliminating welding of the magnetic pole-faces (preferably in all of the cores 21, 22, and 23), the magnetic pole-faces are protected from welding induced problems (page 8, lines 5 to 6).

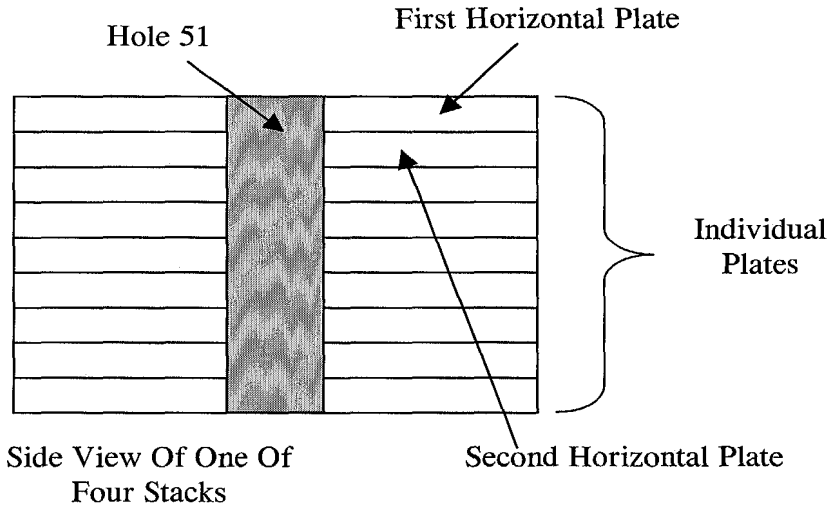
The Cited Art

As previously noted, claims 3 and 6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,793,136 to Redzic in view of U.S. Patent No. 3,597,646 to Lawrenson. The cited art, however, fails to disclose or suggest the structure and/or benefits described in detail above.

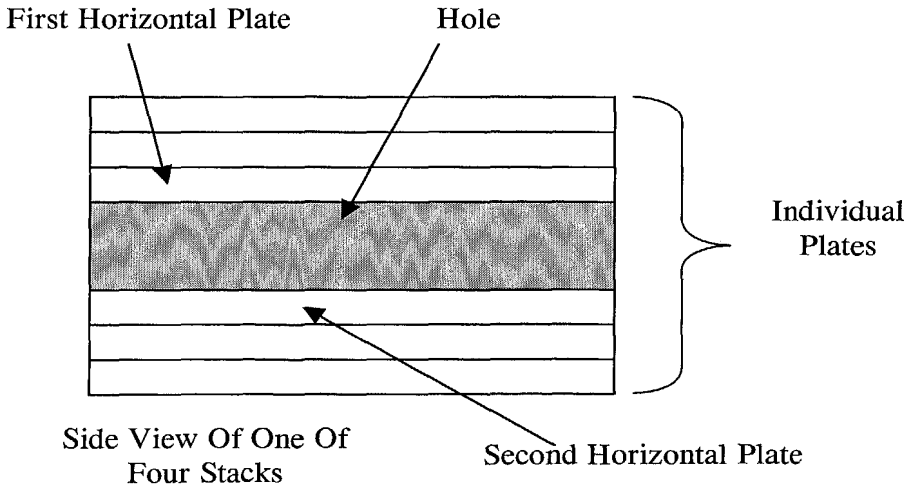
More specifically, the July 30, 2002 Office Action correctly acknowledges that Redzic fails to disclose or suggest a middle core that comprises plural plates (23A) stacked in an axial direction and joined to a first fixing member (26) by a connecting member (28). The July 30, 2002 Office Action asserts, however, that Lawrenson discloses plural plates stacked in an axial direction joined to a first fixing member (57) by a connecting member (52), and that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the middle core of Redzic.

Applicant submits that even if combined, the cited art fails to disclose or suggest that the space through which a bolt passes is formed between adjacent split cores as expressly claimed. As previously explained in Applicant's June 6, 2002 and December 2, 2002 replies, the rotor core (2) of Lawrenson is formed by four segments (3) of magnetic material (col. 2, lines 53-55). All of the stampings have holes 51 through which axial bolts 52 extend and these bolts pass through matching holes 53 in nonmagnetic stainless steel end plates 59 after which they are secured by nuts 54 so that the set of four stacks of stampings are firmly held between end plates 59 (col. 5, lines 56-61).

There are essentially only two ways to potentially achieve "adjacent" split cores in Lawrenson. Neither of these two ways, however, has a hole through which axial bolts extend. As shown in FIG. 8 and sketched below, adjacent cores could be individual horizontal plates (see first and second horizontal plates) stacked flush on one another in one of the four segments (3) of magnetic material.

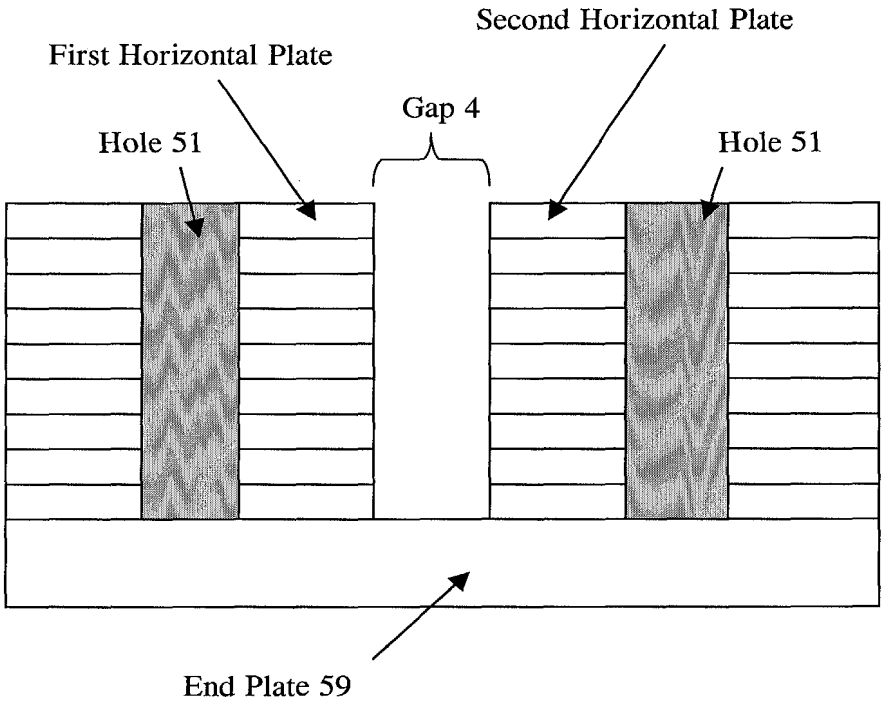


However, the hole 51 which passes down through the stack is not "between" the first horizontal plate stacked on the second horizontal plate; it penetrates vertically through them as shown above. In other words, if the hole 51 was *between* a first horizontal plate and a second horizontal plate in a given stack, the hole 51 would have to be sideways (i.e., horizontal) and the bolt wouldn't penetrate vertically down the stack at all (see hypothetical sketch below). This would not be able to hold the stack together, and is thus completely contrary to the claim language.



Moreover, two plates stacked on top of one another as set forth in the previous examples are not part of two adjacent split cores, they are part of the same core. Hence, the aforementioned configuration does not disclose or suggest that the space through which a bolt passes is formed between adjacent split cores as claimed.

Alternatively, as shown in FIG. 1 of Lawrenson and sketched below, two adjacent cores could be a first horizontal plate in one stack and a second horizontal plate in a second stack "adjacent" to the first stack, the first horizontal plate and the second horizontal plate being in the same horizontal plane.



Hole 51, however, is formed within each stack; i.e., it isn't between adjacent stacks and thus is not *between* adjacent split cores as claimed. Gap 4 cannot be the space between adjacent split cores as claimed, because axial bolts 52 do not pass through the gap 4, they pass through holes 51 within each stack so as to hold the plates within each stack. Hence, the aforementioned configuration also fails to disclose or suggest that the space *through which a bolt passes* is formed between adjacent split cores as claimed.

Thus, as Lawrenson fails to disclose or suggest a space through which the bolt passes that is formed between adjacent split cores, it fails to rectify the acknowledged

deficiency in Redzic. Hence, even as combined by the Office Action, the cited art fails to disclose or suggest the claimed invention.

It is the Examiner's burden to establish the unpatentability of the claims. That burden has not been met.

It is thus respectfully submitted that these claims are patentable over the art relied on.

CONCLUSION

For the reasons set forth above, it is respectfully requested that the final rejection be reversed.

Respectfully submitted,

Date April 11, 2003 By _____

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Appendix A

3. (Once Amended) An electric rotating machine as defined in Claim 6, wherein the plates are ring-shaped thin plates.

6. (Once Amended) An electric rotating machine, comprising:

a middle core comprising plural plates stacked in an axial direction;

an outer core disposed outside the middle core, and which rotates relative to the middle core; and

an inner core disposed inside the middle core, and which rotates relative to the middle core,

wherein the plural plates are joined to a first fixing member by a connecting member,

wherein the middle core is a stator core, and the outer core and inner core are rotor cores, and

wherein the stator core is formed by a plural split core, the connecting member is a bolt, and a space through which the bolt passes is formed between adjacent split cores.